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Physical activity profiles and perceived environmental determinants in New Zealand: a national cross-sectional study.

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Abstract

Background A minority of adults in developed countries engage in sufficient physical activity (PA) to achieve health benefits. This study aims to identify modifiable perceived resources and barriers to PA among New Zealand adults.

Methods Secondary analysis of a 2003 nationally representative cross-sectional mail survey, stratified by region, age, and ethnicity, and analysed utilising ordinal logistic regression.

Results Overall, n=8,038 adults responded to the survey, of whom 49% met updated guidelines for sufficient PA. Perceived accessibility of local resources was associated with PA; however for some resources there was more awareness amongst individuals whose predominant activity was not commonly associated with that resource eg health clubs and walkers. Perceived local environmental barriers demonstrated negative (steep hills, crime, dogs) and positive (unmaintained footpaths) associations. The absence of perceived environmental barriers was strongly associated with increased activity, suggesting the number of barriers may be a critical factor.

Conclusion Complex relationships between perceptions of local environments and activity patterns among adults were found. Although complex, these results demonstrate positive associations between awareness of resources and perceived lack of barriers with being sufficiently physically active for health. Therefore, investments in provision and/or promotion of local resources have the potential to enable active healthy communities.

Introduction

There is significant evidence for the benefits of a physically active lifestyle, including reduced risks of developing many non-communicable diseases, such as coronary heart disease, obesity, certain cancers, and type II diabetes [1,2]. Although the relationship between physical activity(PA) and reduced chronic disease has been clearly documented, it is estimated globally that 58% of adults aged 15 or older engage in insufficient PA for health benefit [3], of which 17% engage in almost no PA.

Guidelines on the levels of PA sufficient to improve and maintain health have been recently updated for adults and older adults [4,5]. These updated guidelines include recommendations for both moderate and vigorous activity levels and specify either; 3 or more 20 minute sessions per week of vigorous activity marked by elevated respiration and heart rate (eg jogging); or 5 or more 30 minute sessions per week of moderate aerobic activity (eg brisk walking).

Growing evidence indicates that neighbourhood characteristics influence residents' levels of PA. Environmental design has been identified as a key determinant in sustaining participation in PA, especially for moderate PA such as walking [6,7]. Many elements of the neighbourhood may influence PA, including various aspects of functionality, safety, aesthetics, and destinations [8], each relating differently to different types of PA.

Research has found associations between PA and specific elements of the neigbourhood characteristics and environmental designs, including footpath quality[9-11], heavy traffic[12,13], lighting[14], ascetics[9], dog presence[15], crime[16] and perceived safety[12,13]. For example, perceived availability of footpaths has been positively associated with walking and moderate activity [10] and overall activity [11]. However, contrary to expectations, perceived heavy automobile traffic has been positively associated with walking for transport and overall activity [12,13], and poor quality footpaths and ascetics have been positively associated with

recreational walking [9]. It is hypothesised that recreational walkers have more contact and awareness of negative elements of the local environment.

The presence of resources and settings for residents to participate in PA may significantly influence activity. Such resources may include public open spaces, parks, and swimming pools and commercial private facilities such as health clubs, gyms, and sports equipment shops. Previous research has demonstrated that PA destinations are associated with various categories of PA. Accessibility to open spaces and parks has been associated with walking [12,17], cycling [18] and overall PA [17,19]. Accessibility to exercise facilities has been found to be positively associated with walking [20,21], and increased general activity [11,19,22-24]. The reverse has also been demonstrated; a lack of PA destinations predicts decreased walking [12,25], and a lack of equipment and facilities is negatively associated with sport and exercise participation [26].

This research utilises responses from 2003 national representative 'Obstacles to Action' (OTA) study that examined the influence of perceived resources for and barriers to recreational PA in New Zealand adults[27]. Badland et al[28] previously utilised the OTA database to demonstrate differentials in physical activity levels, and perceptions of physical and social barriers to physical activity by size of town/city. This research demonstrated the importance of adjusting for town/city differences when examining physical activity and environmental enablers or barriers. Hutton et al[29] also utilised the OTA database in a case-control study examining PA and the associated motivators and obstacles for people with arthritis. This research identified differences in levels of PA for people with arthritis but no differential impact of environmental barriers to PA, which demonstrates the importance of including the presence of chronic conditions such as arthritis in the research design and modelling of PA.

Previous research has primarily focused on individual measures of walking, moderate,

vigorous or overall PA. While these studies have demonstrated some commonalties across categories of PA, an individual's PA experience usually includes multiple modes and intensities. This paper aims to describe New Zealander's PA profile in relation to the updated PA recommendations and examine a more complex profile of the PA modes and intensities, and their varying associations with key perceived environmental determinants.

Methods

Design

This research is a secondary analysis of data collected in a nationally representative population mail survey 'Obstacles to Action' in New Zealand [27]. The survey was a stratified two stage random sample of adult on the New Zealander electoral role. Initial stratification was by geographic region, and the second stage by age group (18-24, 25+ years old) and Maori ethnicity.

Procedure

In order to optimise response rates, multiple mail contacts were made with the eligible population. These included a pre-notification letter, questionnaire with carefully worded cover letter, reminder postcard, first reminder letter and questionnaire, and a second reminder letter and questionnaire. This survey was conducted by the market research company Colemar Brunton in 2003, on behalf of Sport and Recreation New Zealand (SPARC).

Instruments

The survey instrument was an adaptation of a questionnaire developed by the American Cancer Society. Advisors form SPARC and the New Zealand Cancer Society modified the initial survey for the New Zealand context and pilot tested before implementation of the survey. Detailed information about the questionnaire development are described elsewhere[30].

This analysis focuses on; measures of the accessibility of PA resources and settings, environmental barriers and PA levels. Accessibility and barriers were measured using respondents' self report of PA resource and settings as "readily available in your neighbourhood or at work" or similarly awareness of a local neighbourhood barrier. A summary measure of the total number of resources and settings identified as available was also calculated.

Self-reported PA was collected using the New Zealand Physical Activity Questionnaire (NZPAQ) which was adapted from the International Physical Activity Questionnaire (IPAQ) and validated for the New Zealand population [31-33]. The PA data was classified into categories defined by meeting recommended levels of PA for walking, moderate and vigorous categories of PA. Walking has been separated from moderate activity, as many neighbourhood measures should directly influence walking participation.

Mutually exclusive PA categories were specified as follows: "Sedentary" (no reported PA); "Insufficient" (some PA below recommended levels for moderate, vigorous or combined); "Sufficient combined activity" (only meet recommended levels when combined across activity intensities); "Sufficient by walking" (greater than 5 x 30 minutes of walking per week); "Sufficient by other moderate activity" (greater than 5 x 30 minutes of moderate activity per week with only a small walking component); "Sufficient by vigorous activity" (greater the 3 x 20 minutes of vigorous activity per week); "Sufficient moderate and vigorous PA" (both sufficient moderate and sufficient vigorous activity recommendations were

achieved). These categories utilise the revised guidelines, and also separate out walking from other moderate activities as walking is often used to access physical activity resources as well as a physical activity itself.

Standard demographic and general health measures were collected on age, sex, ethnicity, education, personal income (median New Zealand salary in 2003 was NZ$20,852), family composition, town/city size, and any chronic physical or mental health conditions.

Statistical Analysis

Sampling weights for the statistical analysis were calculated using the sample selection probabilities and post-stratification weighting to adjust for differential non-response. Nominal logistic regression was used to examine associations between PA categories and perceived availability of each resource/setting or neighbourhood environmental barrier. The models were adjusted for sex, ethnicity group, age group, number of chronic health conditions, income group, education, presence of children and/or infants in household, town or city category, and sampling weights. Adjusted odds ratios (OR) and 95% confidence intervals (95% CI) is reported for associations between environmental factors and PA groups. All statistical analyses were conducted using SAS version 9.1. (SAS Institute, Cary, NC. www.sas.com), and a significance level of α=5% was used for all statistical tests.

Results

Participants

The questionnaire was a mailed to a 14,000 adults, of which 426 were considered ineligible (ie were returned undelivered). Sixty-one percent of contacted eligible adults responded to the survey resulting in 8,291 usable questionnaires; however 253 did not complete the sections on PA and local environments and were excluded from this analysis.

Physical Activity Profiles

There are 8,038 respondents in our sample from the "Obstacles to Action" survey distributed across all PA categories (Table 1) with respondents engaging in several categories of PA each week. Of these, 51% were sedentary or did not engage in sufficient PA for maintaining health. Respondents reported spending on average 424 minutes per week engaged in PA (median 225 minutes, interquartile range 70-520 minutes). Respondents meeting the guidelines for walking alone also reported that 31% of their PA time, on average, was being spent in other moderate activity and 8% in vigorous activity. Also 12% of the population is highly active, with both moderate and vigorous activity levels above recommended guidelines, and were active for 1,354 minutes per week on average.

Demographics

Summary PA measures for demographics (Table 2) indicate that; 40% of the respondents are male, who reported on higher levels of sufficient vigorous or sufficient vigorous and moderate PA then females (26% versus 14%). PA levels vary by age, with vigorous activity categories the most prevalent in the youngest age group (16-19 years old), whereas the oldest age group (70 years and older) was the most sedentary. Respondents who were single (16%) or reported their marital status as "Other" (2%) were less likely to be sedentary and more likely to be in the vigorous categories. Sedentary behaviour increased with the number of chronic health conditions. Having infants (0-4 years old) in the household (14%) is associated with slightly more insufficient PA, while having children (5-15 years old) in the household (27%) was associated with reduced walking activity but increased vigorous activity categories. The highest proportions in the walking and other moderate categories were reported by Europeans (73%), whereas the highest proportions for

the vigorous categories were reported by Maori (9%).

Higher educational qualified respondents generally reported lower prevalence of sedentary behaviour and higher rates of total vigorous categories, whereas non-degree tertiary qualification corresponded to higher levels of walking and other moderate categories. This corresponded to a similar pattern in personal income, with higher income respondents reporting less sedentary and more vigorous behaviour, and medium income respondents reporting more walking and moderate behaviour. Respondents from small towns reported more walking activity, and increasing reporting of sufficient moderate and vigorous PA was associated with decreasing town/city size

The demographics (Table 2) cover domains of family composition, life stage; ethnicity, socio-economic status, and town/city size; which have all been demonstrated in prior research to be associated with PA levels. These demographics were examined in an initial nominal logistic regression analyses for associations with the PA categories, and all demographics demonstrated significant associations in univariate and multivariable models and are therefore included in all further models.

Multivariable Models for Local Physical Activity Resources and Settings

The results of the nominal logistic regression models of reported PA resources and settings are presented in Table 3. All resources are associated with increased PA; except for presence of a swimming pool, beach or lake (p=0.06). In all cases, resources have the most impact on the highly active group (relative to the sedentary group) and had OR ranging from 1.30 for awareness of community recreational centre to 2.09 for home exercise equipment. For community recreation centre (OR=1.30, 95% CI 1.05-1.60) and walking groups (OR=1.67, 95% CI 1.35-2.06) the highly active category was the only category that was significantly different from the sedentary group.

Awareness of five resources (walking tracks, public parks with playing fields, shower at work, home exercise equipment and organised sport) were significantly related to being active across all categories of physical activity, with generally the highest ORs for the vigorous activity categories and intermediate level ORs for the walking and moderate activity categories. However only organised sport demonstrated a clear consistent trend across groups in the direction hypothesised, with increasing ORs corresponding to the increasing contribution of vigorous activity.

Netball or tennis courts only increased likelihood of vigorous activity levels, while all other resources were associated with increased vigorous and moderate activities. The summary measure of the total number of resources and settings available also was positively associated with a slightly increased activity across all categories, with a greater influence on the likelihood of being very high active.

Multivariable Models for Local Environmental Barriers

The effects of perceived neighbourhood environmental barriers are presented in Table 4. Only 5 environmental barriers significantly discriminated across PA groups. Awareness of steep hills was strongly associated with decreased PA with OR between 0.4 and 0.5 for the likelihood of any physically active category, when compared to the sedentary group. Awareness of crime and dog nuisance was generally associated with decreased vigorous activity levels, (i.e. decreased the odds of being in the sufficient combined, sufficient vigorous, and the highly active activity groups). Poorly maintained footpaths were contrary to expectations, with increasing odds ratios across all sufficiently physically active categories and significantly increased likelihood of vigorous activity. The option of no perceived environmental barriers was significantly associated with increased PA, and increasing influence for the more vigorous activity categories.

Discussion

The "Obstacles to Action" survey data indicate that 51% of New Zealand adults are inactive or engage in some PA but insufficient to maintain health. This is comparable to USA 2007 data [34] from the Behavioral Risk Factor Surveillance System, which estimates that nationally 51.2% of the USA population are inactive or engage in insufficient PA. This is also roughly comparable to WHO global estimates [3] of 58%, however the criteria for sufficient PA was lower than the present guidelines.

Socio-environmental differences in PA behaviour are indicated in the crude odds of meeting moderate and vigorous PA recommendations by ethnic and socio-economic groups (Table 1). For example, having a child in the household was associated with lower moderate activity levels but higher vigorous activity levels, this does not directly correspond with any previous research where the presence of children in a household reduces young mothers' engagement in PA [35], however the present research includes members of households other than young mothers that may have different PA behaviour patterns.

Physical Activity Resources and Settings

Several resources and settings were associated with increased levels of PA, but appeared to be somewhat invariant to the PA category. Awareness of netball or tennis courts increased vigorous PA as would be expected. Other settings such as health clubs or gyms near home or work increased both vigorous and walking activity possibly suggesting that they are walking destinations, or located in more walkable areas.

Awareness of walking tracks was positively associated with increased all PA categories relative to the sedentary group, although walking groups only significantly

increased odds of being in the highly active category. Awareness of community recreation centres was also only associated with the highly active category.

Previous research has demonstrated associations between perceived accessibility to PA resources/settings and single modes or intensities of PA; such as walking or overall levels of PA [17,36], but have not examined the impact of multiple modes and intensities of PA.

Only presence of a swimming pool, beach or lake did not improve activity levels possibly due to homogeneity of the population with regards to awareness of bodies of water, as the majority of the New Zealand population live close to the coast and/or have access to swimming pools, in conjunction with regular national and regional water safety promotions that promote awareness.

Local Neighbourhood Environmental Barriers

Poorly maintained footpaths were associated with significantly increased vigorous activity, which may point to an important circularity in this research, respondents who are active are more likely to encounter poorly maintained footpaths. Prior research has found that perceived quality of footpaths was associated with walking and moderate level activity [10] and overall activity [11]. Similarly Duncan and Mummery (2005) reported that perceiving footpaths to be in poor condition was positively associated with recreational walking. The likely reason for this result is that respondents who undertake vigorous activity may be more likely to utilise the local environment and as such are more aware of any of the environmental issues.

Perceived safety indicators awareness of crime and dog nuisance have been associated with inactivity [12,13,37-39], although some studies report dog nuisance to be associated with being active [9,40]. In our data, dog nuisance decreased vigorous activity. Steep hills in the neighbourhood decreased likelihood of all PA categories.

Although the individual environmental barriers show very few significant results, the aggregate measure of the no environmental barriers ("none of the above"), strongly affects walking, moderate, and vigorous activity, maybe suggesting that the number of perceived barriers is critical rather than any individual barrier, or that people actively engaged in PA don't perceive any barriers. Also there was low awareness of any individual barrier being present; varying from 4% to 20%, therefore there was potentially a lack of statistical power for testing some of the barriers association with PA levels.

Strengths and Limitations

This research identified associations between perceived neighbourhood environmental measures and self-reported PA profiles utilising a large nationally representative database with a sophisticated and innovative analysis. The analysis demonstrates associations between key elements of the local environment and increased PA, however is unable to determine the direction of causality, in order to examine this it would be necessary to conduct an expensive longitudinal multilevel study. It is important to emphasise that the PA measures are self-reported and therefore are likely to be inexact due to inherent biases. Social desirability biases may lead to over-reporting, and recall bias that may lead to under-reporting of PA. However this method of measuring PA is the most practical way to measure physical activity for a large population with low associated cost, low participant burden and general acceptability.

Another important consideration is the association between neighbourhood socio-economic status (SES) and the neighbourhood environment. Several studies have shown that higher SES suburbs have greater access to PA resources and settings [12,41-46], although some studies have found the opposite [47]. This analysis adjusted for individual SES and general regional characteristics in multivariable models; however as this is a secondary analysis of

aggregated national data it was not possible to drill down to local neighbourhoods to fully investigate the impact of neighbourhood SES.

Conclusion

Consistent with previous international research findings, but not previously researched in New Zealand, perceptions of local neighbourhood characteristics were found to be significantly associated with PA participation. This analysis aimed to consider the multiple modes and intensities of PA which adults engage in and found significant associations between PA categories and perceived accessibility of PA resources. Our results indicate that perceived accessibility of resources enabling PA strongly shape activity patterns among adults. Also important but to a lesser extent are the impact of perceived environmental barriers on inactivity.

These results demonstrate that promoting and maintaining existing local neighbourhood resources, as well as investments in public infrastructure where resources are not available can contribute towards increasing PA and improving health among New Zealand adults.

Perceived local neighbourhood characteristics may not correspond with what is actually available, and different socioeconomic and cultural backgrounds may impact on perceptions. It would therefore be important to explore these associations between perceptions and objective measures using modern epidemiological approaches recognising that individuals are embedded in households, communities and socio-geographic-political situations.

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Table 1 Percent time in various activity modes/intensities, by physical activity (PA) category

PA Category	N (%)		PA Time (min/week) Mean	Median (IQ range)		% PA time walking	% PA time other moderate[1]	% PA time vigorous
No PA	808	(10%)	0	0	(0, 0)	-	-	-
Insufficient PA	3265	(41%)	139	100	(50, 180)	48%	38%	13%
Sufficient PA (moderate + vigorous)	279	(3%)	379	300	(210, 420)	27%	39%	34%
Sufficient PA – walking	1217	(15%)	582	420	(270, 840)	61%	31%	8%
Sufficient PA – other moderate	930	(11%)	586	480	(300, 841)	24%	67%	9%
Sufficient PA – vigorous	586	(7%)	521	343	(240, 540)	12%	17%	70%
Sufficient moderate PA + Sufficient vigorous PA	953	(12%)	1354	1125	(600, 1800)	24%	34%	42%
Total Cohort	8038	-	424	225	(70, 520)	34%	38%	28%

[1] Moderate activities other than walking

Table 2 Characteristics of "Obstacles to Action" respondents and percentages by physical activity (PA) category

	N	Sedentary (%)	Insufficient PA (%)	Sufficient PA - (moderate + vigorous) (%)	Sufficient PA – moderate walking (%)	Sufficient PA – Total moderate (%)	Sufficient PA - Vigorous (%)	Sufficient moderate and Sufficient vigorous PA (%)
Sex								
Female	4842	11.0	44.1	3.5	15.6	11.3	5.8	8.7
Male	3196	8.6	35.3	3.5	14.4	12.1	9.5	16.7
Age Group								
16-19	338	4.7	36.1	4.1	10.9	9.2	13.6	21.3
20-29	1028	7.9	41.6	4.2	12.5	9.1	10.5	14.7
30-39	1430	9.2	41.1	3.6	12.0	11.3	9.7	13.2
40-49	1833	9.9	40.0	3.8	15.3	12.5	7.6	10.9
50-59	1603	9.7	39.4	2.9	17.5	12.8	5.6	12.0
60-69	1015	9.6	42.4	3.5	18.7	13.1	3.4	9.5
70+	791	19.0	42.0	2.3	16.2	9.6	4.1	7.0
Marital Status								
Single	1268	7.1	38.6	3.9	13.6	10.0	10.4	16.3
Married/living with partner	5614	10.1	40.9	3.3	15.5	12.3	7.0	10.9
Separated/divorced	596	11.1	38.9	4.5	15.9	11.9	5.9	11.7
Widow/er	410	17.8	44.2	2.7	16.3	8.3	2.4	8.3
Other	142	7.0	44.4	2.8	8.5	6.3	12.7	18.3
Any Infants (<5 years old)								
No	6587	9.9	40.2	3.5	15.6	11.6	7.4	11.8
Yes	1057	9.9	43.3	4.3	12.1	11.8	7.3	11.3
Any Children (5-15 years old)								
No	5616	9.9	40.9	3.4	15.9	11.7	6.7	11.5
Yes	2030	9.9	39.7	4.0	13.2	11.4	9.3	12.6
Chronic Health conditions								
None	5424	8.5	39.0	3.7	15.2	11.9	8.5	13.3
One	1630	11.4	43.4	3.5	15.5	11.6	5.6	9.1
Two or more	984	16.6	45.2	2.2	14.2	9.9	3.6	8.3

	N	Sedentary (%)	Insufficient PA (%)	Sufficient PA - (moderate + vigorous) (%)	Sufficient PA – moderate walking (%)	Sufficient PA – Total moderate (%)	Sufficient PA - Vigorous (%)	Sufficient moderate and Sufficient vigorous PA (%)
Ethnicity								
European	5841	9.8	40.5	3.4	15.4	12.1	7.1	11.6
Maori	706	9.6	38.2	3.8	13.0	9.4	9.2	16.7
Pacific	193	14.0	37.3	4.2	15.0	7.8	6.7	15.0
Asian	344	13.7	47.1	3.8	11.3	8.4	8.7	7.0
Other	941	9.7	41.6	3.4	16.1	11.9	6.5	11.0
Education								
No qualification	1493	15.9	39.8	2.4	15.7	9.7	5.0	11.6
Secondary qualification	2399	10.1	41.1	3.3	15.4	10.9	7.4	11.8
Tertiary qualification	2616	8.3	39.7	3.6	14.7	14.0	7.0	12.7
University degree	1444	6.7	42.4	4.7	14.9	10.4	10.1	10.8
Not Reported	86	17.4	39.5	2.3	15.1	8.1	5.8	11.6
Personal Income (NZ$)								
0-10,000	1462	10.0	43.8	3.2	14.6	10.8	7.1	10.5
10,001 – 20,000	1516	10.9	43.5	2.6	15.8	11.7	5.6	9.8
20,001 – 30,000	1096	10.8	39.6	2.7	14.9	13.2	5.6	13.3
30,001 – 40,000	1123	9.4	35.5	4.5	16.0	13.0	7.1	14.4
40,001 – 50,000	743	8.5	40.1	4.6	15.3	10.5	7.5	13.5
50,001 – 70,000	719	7.7	39.6	3.6	15.6	12.7	9.6	11.3
>70,000	562	7.8	38.1	4.6	13.9	9.8	14.2	11.6
Not Reported	817	13.7	40.9	3.4	14.3	9.7	6.2	11.7
Town/City Size								
Large city (>100,000)	3342	9.6	42.3	3.7	15.0	10.1	8.6	10.7
Small city (30,000-100,000)	1616	9.9	40.9	3.4	14.6	13.6	6.4	11.2
Large town (1,000-29,999)	1715	10.2	40.1	3.6	14.4	12.2	6.4	13.1
Small town (<1,000)	1092	9.8	36.5	2.8	16.7	12.4	7.1	14.7

Table 3 Reported physical activity (PA) resources and settings

Resource reported by respondent as available	Awareness (%)	Sedentary	Insufficient PA		Sufficient PA - (moderate + vigorous)		Sufficient PA – moderate walking		Sufficient PA – other moderate		Sufficient PA - vigorous		Sufficient moderate + Sufficient vigorous PA		p-value
		OR	OR (95% CI) †		OR (95% CI) †		OR (95% CI) †		OR (95% CI) †		OR (95% CI) †		OR (95% CI) †		
Cycle lanes or paths	47.3	1.00	1.39	(1.17, 1.66)	1.20	(0.88, 1.63)	1.50	(1.21, 1.87)	1.50	(1.21, 1.87)	1.39	(1.11, 1.74)	1.56	(1.27, 1.93)	0.0007*
Walking group	47.1	1.00	1.08	(0.90, 1.30)	1.25	(0.91, 1.70)	1.22	(0.99, 1.50)	1.15	(0.92, 1.44)	1.25	(0.99, 1.58)	1.67	(1.35, 2.06)	<0.0001*
Walking tracks	69.8	1.00	1.25	(1.04, 1.49)	1.75	(1.25, 2.45)	1.49	(1.20, 1.85)	1.36	(1.08, 1.71)	1.33	(1.05, 1.69)	1.92	(1.53, 2.41)	<0.0001*
Public park with playing fields	84.4	1.00	1.67	(1.34, 2.08)	1.58	(1.03, 2.41)	1.50	(1.16, 1.95)	1.67	(1.26, 2.22)	1.93	(1.40, 2.68)	1.69	(1.28, 2.23)	<0.0001*
Swimming pool, beach or lake	78.4	1.00	0.96	(0.78, 1.18)	1.15	(0.79, 1.67)	1.13	(0.89, 1.43)	1.05	(0.82, 1.36)	0.99	(0.76, 1.30)	1.32	(1.03, 1.70)	0.06
School gym/pool open to community on weekends	45.7	1.00	1.12	(0.94, 1.34)	1.05	(0.78, 1.42)	1.27	(1.04, 1.55)	1.10	(0.89, 1.37)	1.19	(0.95, 1.50)	1.55	(1.26, 1.90)	0.0004*
Netball or tennis court	72.4	1.00	1.06	(0.88, 1.28)	1.69	(1.17, 2.43)	1.21	(0.97, 1.51)	1.01	(0.80, 1.28)	1.37	(1.06, 1.78)	1.42	(1.13, 1.80)	0.0006*
Community recreational centre	52.4	1.00	1.00	(0.84, 1.19)	1.08	(0.80, 1.47)	1.18	(0.96, 1.44)	0.86	(0.69, 1.06)	1.03	(0.82, 1.29)	1.30	(1.05, 1.60)	0.001*
Health club or gym near work	59.7	1.00	1.09	(0.91, 1.31)	1.39	(1.00, 1.93)	1.37	(1.11, 1.70)	0.99	(0.79, 1.23)	1.56	(1.22, 1.99)	1.46	(1.18, 1.83)	<0.0001*
Health club or gym near home	57.6	1.00	1.14	(0.95, 1.36)	1.11	(0.81, 1.51)	1.25	(1.01, 1.54)	1.09	(0.87, 1.35)	1.50	(1.18, 1.90)	1.41	(1.14, 1.75)	0.003*
Shower at work	41.0	1.00	1.29	(1.06, 1.57)	1.94	(1.40, 2.69)	1.35	(1.07, 1.69)	1.38	(1.09, 1.75)	1.91	(1.50, 2.45)	1.77	(1.41, 2.23)	<0.0001*
Home exercise equipment	35.0	1.00	1.36	(1.13, 1.65)	1.61	(1.18, 2.21)	1.32	(1.06, 1.64)	1.36	(1.08, 1.72)	1.73	(1.37, 2.20)	2.09	(1.68, 2.60)	<0.0001*
Organised sport (like touch rugby, netball)	67.0	1.00	1.30	(1.08, 1.55)	1.48	(1.07, 2.06)	1.42	(1.14, 1.75)	1.46	(1.16, 1.83)	1.73	(1.35, 2.22)	2.04	(1.62, 2.57)	<0.0001*
Sports shop	60.1	1.00	1.17	(0.98, 1.40)	1.32	(0.96, 1.80)	1.45	(1.17, 1.79)	1.07	(0.86, 1.33)	1.39	(1.10, 1.76)	1.46	(1.18, 1.81)	0.0004*
Number of resource types (0-14) **	-	1.00	1.04	(1.02, 1.07	1.08	(1.03, 1.13)	1.07	(1.04, 1.10)	1.04	(1.01, 1.07)	1.09	(1.06, 1.13)	1.13	(1.10, 1.17)	<0.0001*

Adjusted for age, sex, ethnicity, income, education, chronic conditions, marital status, children or infants in household, town/city size, and sample weights

† Reference is sedentary group ie no reported moderate or vigorous PA

* Significant at $p < 0.05$ ** Total number of categories of the above specified resources

Table 4 Reported environmental barriers in the local neighbourhood

	Awareness (%)	Sedentary OR	Insufficient PA OR (95% CI) †		Sufficient PA - (moderate + vigorous) OR (95% CI) †		Sufficient PA - moderate walking OR (95% CI) †		Sufficient PA – other moderate OR (95% CI) †		Sufficient PA - vigorous OR (95% CI) †		Sufficient moderate + Sufficient vigorous PA OR (95% CI) †		p-value
There are not enough footpaths	11.6	1.00	0.86	(0.66, 1.11)	0.86	(0.53, 1.40)	0.76	(0.56, 1.04)	0.77	(0.55, 1.07)	0.61	(0.42, 0.89)	0.68	(0.49, 0.94)	0.12
Footpaths are not well maintained	13.8	1.00	1.10	(0.86, 1.42)	1.66	(1.09, 2.53)	1.32	(0.99, 1.77)	1.06	(0.77, 1.47)	1.23	(0.87, 1.74)	1.55	(1.15, 2.10)	0.01*
Traffic is too heavy	19.4	1.00	0.81	(0.66, 1.01)	0.73	(0.49, 1.08)	0.88	(0.69, 1.13)	0.75	(0.57, 0.98)	0.83	(0.63, 1.10)	0.79	(0.61, 1.02)	0.38
There are steep hills	11.7	1.00	0.79	(0.62, 1.00)	0.53	(0.32, 0.86)	0.49	(0.36, 0.66)	0.38	(0.27, 0.55)	0.53	(0.37, 0.75)	0.44	(0.32, 0.61)	<0.0001*
There is not enough street lighting	20.8	1.00	1.01	(0.81, 1.26)	1.58	(1.12, 2.26)	1.08	(0.84, 1.39)	0.94	(0.72, 1.23)	0.89	(0.67, 1.19)	1.00	(0.77, 1.30)	0.07
There are not enough cycle lanes or paths	19.0	1.00	083	(0.67, 1.04)	0.98	(0.68, 1.42)	0.79	(0.61, 1.03)	0.98	(0.75, 1.28)	0.74	(0.56, 0.99)	0.94	(0.73, 1.22)	0.16
There are too many stop signs/lights	3.6	1.00	0.98	(0.63, 1.55)	0.46	(0.17, 1.29)	0.88	(0.50, 1.53)	0.72	(0.38, 1.35)	0.82	(0.44, 1.50)	1.29	(0.76, 2.17)	0.26
The scenery is not that nice	8.0	1.00	1.02	(0.74, 1.41)	0.94	(0.54, 1.63)	0.92	(0.62, 1.35)	1.01	(0.67, 1.51)	0.68	(0.44, 1.06)	0.79	(0.53, 1.16)	0.31
I rarely see people walking or being physically active	7.7	1.00	0.93	(0.68, 1.26)	1.05	(0.62, 1.81)	0.77	(0.53, 1.12)	0.61	(0.40, 0.94)	0.77	(0.50, 1.19)	0.74	(0.51, 1.09)	0.17
There is a lot of crime	11.2	1.00	0.95	(0.73, 1.24)	0.52	(0.30, 0.91)	1.19	(0.87, 1.62)	1.00	(0.71, 1.40)	0.52	(0.35, 0.78)	0.88	(0.63, 1.22)	0.0007*
Dog nuisance	19.0	1.00	0.85	(0.69, 1.05)	0.51	(0.33, 0.79)	1.06	(0.83, 1.35)	0.77	(0.59, 1.01)	0.75	(0.56, 1.01)	0.69	(0.53, 0.90)	0.0007*
None of the above	46.2	1.00	1.06	(0.89, 1.27)	1.13	(0.83, 1.53)	1.32	(1.07, 1.61)	1.26	(1.02, 1.57)	1.28	(1.02, 1.62)	1.49	(1.21, 1.84)	0.0002*

Adjusted for age, sex, ethnicity, income, education, chronic conditions, marital status, children or infants in household, town/city size, and sample weights

† Reference is sedentary group ie no reported moderate or vigorous PA

* Significant at $p < 0.05$